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ABSTRACT

One of the major goals of mathematics education reform efforts is for students to become more confident in their abilities. This paper suggests that computer conferencing provides a way to change classroom practice so that students can work together in a self-paced manner that builds self-esteem and confidence in mathematics. A pedagogical technique that employs computer conferencing as a vehicle for the delivery of mathematics instruction is described. The software employed is a platform that can be used in a classroom, in an entire school, or at greater distances such as throughout a school district. Information on computer conferencing is presented and the benefits of computer conferencing in the mathematics classroom are discussed. Examples of classroom math games using computer conferencing such as, "Math Bingo," "Puzzle," and "Treasure Hunt" are included. (ASK)

COMPUTER CONFERENCING IN MATHEMATICS CLASSROOMS: DISTANCE EDUCATION-THE LONG AND THE SHORT OF IT

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This paper is a description of a pedagogical technique that employs computer conferencing as a vehicle for delivery of mathematics instruction. Examples are given of specific activities that can be used to build confidence and interest in mathematics. The software employed is a platform that can be used in a classroom ("the short of it"), in an entire school, or at greater distances such as throughout a school district ("the long of it").

Several landmark publications have given educators a new vision for the way mathematics should be taught and learned. The National Council of Teachers of Mathematics published *Curiculum and Evaluation Standards for School Mathematics* in 1989. This document and its two companion volumes, *Professional Standards for Teaching Mathematics* (1991) and *Assessment Standards for School Mathematics* (1995) have led the way for mathematics education reform in the last several years and will continue to do so for many years to come.

One of the major goals for students in the new reform efforts is that students become more confident in their abilities. This paper suggests that computer conferencing provides a way to change classroom practice so that students will have the opportunity to work together in a self-paced way that builds self-esteem and confidence in mathematics.

Computer Conferencing

The authors propose the use of networked computers as a medium for students to work at their own pace, perhaps at different times, with software that collects, organizes, and displays the thinking and work of each student in a learning team. Each team member can edit or annotate the work of other team members. For more information on the use of computer conferencing in teaching, see Klemm, 1996 and Christal and Lamb, 1993.

Most computer software that is used for conferencing is "glorified e-mail"(Klemm and Snell, 1994). That is, students post a note and other students attach their notes to it. To get the most out of computer conferencing, students need to work on the same documents, attaching notes in context to specific places within a document-"writing in the margins", so to speak. Thus, conferencing software for mathematics teaching should use hypermedia as the organizing principle to link ideas in context. Student work is not forced into some rigid hierarchy. It is possible for students to create relationships among ideas that are most meaningful for them. In an era of television, which has conditioned students to have short attention spans, the chunking of information provided by hypermedia enables the topic to be delivered in small parcels.

The requirements for document sharing, hypermedia, and in-context annotation are satisfied by the hypermedia-based computer conferencing system, FORUM(TM). FORUM allows the teacher to create logical structures of disclosure that specify what can be linked to what. This can help student groups stay focussed and help to orchestrate their learning. To obtain more information about FORUM, write to: Forum Enterprises, Inc., P. O. Box 5755, Bryan, TX, 77805-5755(WWW site: http://www.ForumInc.com).

Benefits in the Mathematics Classroom

A computer conference can be structured so that each student must interact with peers in solving mathematics problems. Because this interaction is tangible and visible, the learning may be even more "active" than it is in non-computer cooperative learning situations. For some students, the involvement may be limited at first to asking questions of the peer group."How did you guys draw that conclusion? Why is that the right stategy?" Note that in a conferencing environment, student questions are less embarassing, because the only people who know are fellow group members, and perhaps the teacher. A computer conference might also make the thinking process more explicit, because everybody's ideas are written down. To the extent that writing "makes the precise man," as Emerson said, the conferencing medium can help students achieve the precision necessary for

good performance in mathematics. Effective use of language is critical to learning (Gallard, 1993), and a conferencing paradigm requires students to think through mathematics problems with the precision of written language.

As for giving up too soon, students in a computer conference have the chance to see that others are stumbling too and perhaps that others have helpful insights into the problem. By seeing what each member of a group does and does not know, students see explicit opportunites to help each other. Participants should be encouraged by the prospect that working together will help them succeed as individuals. Each person's thoughts are documented, making it easier for the teacher to monitor class progress and determine where help might be needed.

The computer environment provides ample time for research, reflection, and integration of mathematics concepts. This is especially true if students are allowed to work on the problems outside of class. In fact, computer conferencing creates a scenario where class never has to end!

Computer conferencing helps children to set their own pace without feeling as though they are "on the spot". If a group needs more time, they can have it. The self-pacing nature of the conference might be best used, at first, with students on an individual basis. That way children will experience success for themselves. As they begin to work in groups, they will be more confident of their abilties.

At first, it might seem strange to have students in class working together via computer rather than just talking to each other. Of course, students do not have to be networked via computers to do team (cooperative) learning. However, the authors believe that team learning in a computer environment can provide special benefits over face-to-face work (Klemm, 1995). In addition to the benefits of putting ideas on paper as mentioned above, there are also potential social advantages. In a conferencing situation, shy or reserved students have a better chance to contribute and be heard. Agressive students have less power with which to dominate. Social stresses and personalty conflicts can be lessened. Each student's work can be more efficient, because there are fewer distractions. Further, the teacher also has the opportunity to give the students the chance to remain anonymous in the computer conference setting.

Computer conferencing can be an avenue for students to experience success. The response time for questions is private and the student isn't intimidated by others who are faster. This developing confidence in the ability to do mathematics will make the experiences more enjoyable rather than something to be feared.

Classroom Examples***

"Math Bingo"

"Math Bingo" is used to help students have fun while learning mathematics. Any aspect of mathematics can be taught using "Math Bingo". The students can play individually or in groups. It is up to the teacher.

Pre-Bingo

1. The students will receive 25 mathematics problems to solve. This can be done with a handout or via the computer conference. If the students are working in groups, the teacher can divide the problems among the students and have them review and comment on each others' answers when they have finished the problems.
2. After the students have answered all of the problems or questions, the game can begin. The teacher puts an electric Bingo card in the conference workspace for each student or student group.

Example Bingo Card - Geometry

side-side-side postulate	exterior angle theorem	hypotenuse-leg theorem	side-side-side theorem	area cong. postulate
triangle proportionality theorem	45-45-90 theorem	side-angle-side postulate	isosceles triangle theorem	hypotenuse-angle theorem
pythagorean theorem	angle-side-angle theorem	side-angle-side theorem	angle-side-angle-side-angle theorem	30-60-90 theorem
area addition postulate	side-angle-side-angle-side theorem	converse pythagorean theorem	angle-angle-side theorem	angle-angle postulate
leg-angle theorem	area postulate	triangle-angle bisector theorem	midsegment theorem	leg-leg theorem

Instructions

For each theorem or postulate, the student is given a set of information, which includes:

* statement of the theorem or postulate
* an example of how the theorem or postulate is applied
* a memory aid
* a question or problem to solve

Game Procedure

The game can be played in a single session or over several sessions. The basic procedure is:

1. Numbered clues are presented in the conference. The clues are taken from the statement, application, memory aid, or question/answers of the basic instruction set.
2. For each square that matches a clue, the student will type in the clue number.
3. When the student gets Bingo (five numbered boxes vertical, horizontal,or diagonal), the student sends an e-mail to the teacher, who then verifies that the card is correct.

* If Bingo is played in a contest mode, FORUM software allows each student or student group to see the cards of other students, but a given student can write only on his/her own card. The race is on, and students can see how their own card compares. In this case, you would not want students to display the clue numbers on the cards publicly until after the game is over.

"PUZZLE"

This game can be played with as many players as desired. Each player or group of players will have the same screen available (displaying a grid with numbered squares). Each square will correspond with a numbered problem on the bottom of the screen (underneath the grid). Some of the squares will be FREE, e.g. one square per row, randomly placed. As the students solve the problems correctly, a piece of the puzzle will be displayed. Puzzle pieces asociated with the free spaces will already be displayed.

Procedure

In order to solve the puzzle, the student group will choose a problem by clicking on the problem statement, which is a hypertext link anchor to a FORUM article that acts as a workspace. To prevent guessing and to receivefull credit for the problem, the workspace must show how the problem was solved. The group could then click on an options icon, which is a hypertext link anchor to a FORUM article that presents four solution options:

a. possible solution 1
b. possible solution 2
c. possible solution 3
d. possible solution 4

Clicking on an option, which is a link anchor, opens a FORUM article that tells whether the choice is correct. If the wrong answer is selected, the group can rework the problem, showing the new solution in a linked workspace, and repeat the selection of another possible solution. A correct choice leads to a graphic of the puzzle piece, which can be cut and pasted to a collage that collects all the puzzle pieces. In version 3.0 of FORUM, students can cut and paste the puzzle pieces and drag them around to try to complete the puzzle.

Scoring

Each problem will earn 5 points if solved correctly. The teacher can award fewer points for correct answers that take more than one try to achieve. NO hints will be given during the game - students need to know how to work the problems. Students may want to guess what the puzzle depicts at any time for 10 bonus points; however, in order to win the game they still have to solve as many problems as possible in the time alotted to play the game (the player/team with the highest score will be the winner).

Puzzle Grid - numbered blocks are associated with a given problem number. "Free space" shows the graphic of a puzzle piece.

10	free	5	16	3	24	13	8
9	19	15	free	27	6	26	22
20	4	21	28	12	2	17	free
free	11	25	18	1	23	14	7

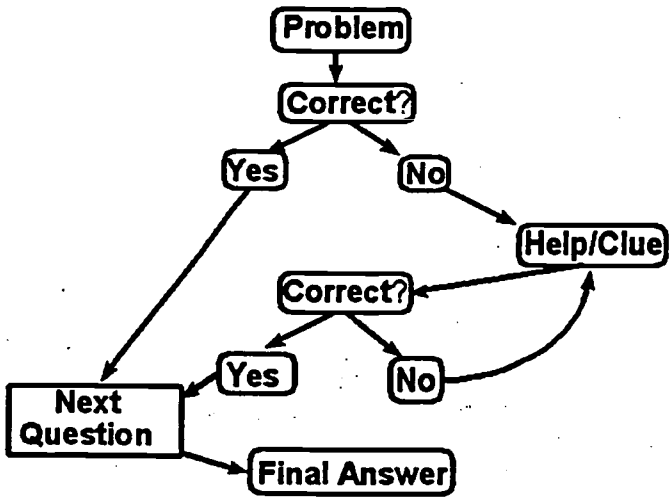
"TREASURE HUNT"

Treasure Hunt is a game that gives a student or group of students a mathematics problem to solve. In order for the student groups to get the correct answer, a series of related questions need to be answered correctly. The group has the opportunity to receive help and clues that might help to solve the problem.

Playing Treasure Hunt in a Computer Conference

The teacher can give a piece of the problem to the students everyday via theconference. The teacher sets up the conference in a logical structure for hypertext links that enhances the ability of the students in a group to ask each other questions, suggest strategies, and debate answers. When the group agrees on an answer, they select one of the answer choices and find out whether they are correct or not. If not, they can click on an icon that takes them to a workspace where they ask the teacher questions and seek new clues. The students would have to come up with the correct answer before they could move on to the next piece of the problem. The first group to finish the main problem wins.

Link Patterns for Treasure Hunt



Example Problem:

Mrs. Puddentane has been admitted to Our Pain and Misery Hospital with a very painful condition called flatus incarceratus. Dr. Zeuss is her physician. During today's rounds he ordered pain medication to be administered as follows:

Rx: Antiflatissma 50 mg/kg/d (50 milligrams per kilogram per day)
Sig. : qid (Administer 4 equal doses per day)
The medication is available in 50 mg/ml concentration (50 milligrams per milliliter).
Mrs. Puddentane weighs 197 lbs.
How many teaspoons of the medication should she receive for each dose ?
Answer choices: 1970 tsp (incorrect) 4.476 tsp (correct)

Conclusions

Change the routine! Use computer conferencing to put "Fun and Games" into the mathematics classroom. Teachers and students might be entertained and learn at the same time. Many children will not realize that they are learning while playing the games. In addition, groups working together can extend their learning by creating their own games.

This paper has pointed out several possibilities for the use of computer conferencing in the mathematics classroom. Teacher imagination and creativity can lead to many other interesting uses.

*** The authors wish to acknowledge the contributions of Ms. Cheri Floyd in the development of the games used in the classroom examples.

References

Christal, M and Lamb, C.E., 1993. Can we change teachers' beliefs about teaching and learning in preservice teacher education? Texas Researcher, 4, 57-64.

Gallard, A. J. 1993. Learning science in multicultural environments. In K. Tobin(Ed.), The Practice of Constructivism in Science Education. Washington, D.C.: AAAS Press, pp. 171-180.

Klemm, W.R. and Snell, J.R., 1994. Teaching via networked PC's: what's the best medium? Technologial Horizons in Education, 22(3),95-98.

Klemm, W.R., 1995. Computer conferencing as a cooperative learnng environment. Cooperative Learning and College Teaching, 5(3), 11-13.

Klemm, W.R., 1996. Using computer conferencing in teaching. Community College Journal, In Press.

National Council of Teachers of Mathematics, 1989. Curriculum and Evaluation Standards for School Mathematics. Reston, VA: NCTM.

National Council of Teachers of Mathematics, 1991. Professional Standards for Teaching Mathematics. Reston, VA: NCTM.

National Council of Teachers of Mathematics, 1995. Assesssment Standards for School Mathematics. Reston, VA: NCTM.

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